A review on the fabrication techniques of functionally graded ceramic-metallic materials in advanced composites

ABSTRACT

Whenever two or more dissimilar materials are bonded, large jump in the stresses occurred at the interface during the fabrication will leads to the delamination and poor load-bearing performance on the final structures. Functionally graded material (FGM) which has compositional and microstructure gradient along its thickness was introduced to be a great solution to this problem. Aiming for the best technique to be implemented, this paper presents an extensive review on the various fabrication techniques of FGMs composed by metallic and ceramic phases. Fabrication techniques in this field of work have incorporated many concepts from different background of gradation processes and consolidation or sintering processes. Each of these processes however has their own advantages and disadvantages. The best technique to be applied can be found by considering some critical issues highlighted in published literatures. This review concluded the powder metallurgy (PM) as the most suitable technique certainly for mass production and up-scaling of the FGMs. The selection was strengthen after considering the advantages of the technique such as process cost-effectiveness, reliability of the practical implementation of the process and the high capability of the process to control the quality of the FGMs.

Keyword: Functionally graded material (FGM); Fabrication; Powder metallurgy (PM)